Defense Science & Technology

13th Annual Software Technology Conference

April 30 2001

Deputy Under Secretary of Defense (Science & Technology)

This presentation has been edited to remove personally identifiable information iaw

Mission

. . . to ensure that the warfighters today and tomorrow have superior and affordable technology to support their missions, and to give them revolutionary war-winning capabilities.

Office of the Deputy Under Secretary of Defense for Science and Technology

Defense Science and Technology

A Focus on Revolutionary Advances

Stealth

Adaptive Optics and Lasers

GPS

Night Vision

Phased Array Radar

Predator Unmanned Aerial Vehicle

Tactical surveillance

Airborne Systems:
138K SLOC
C, PLM

- **Avionics**
- **Engine control**
- **Sensors**
- **Data collection**

Predator UAV

Predator Unmanned Aerial Vehicle

Predator Ground Control Station

Ground Systems:
487K SLOC
C, PLM

- **Ground control**
- **Communications**
- **Data manipulation**
- **Training simulation**
- **Mission planning**

Comanche RAH-66

Reconnaissance and attack

Airborne Systems: 1992K SLOC
Ada, C, Assembly

- Flight control 155K
- Radar 170K
- Cockpit functions
- Engine control 57K
- Night pilot
- Target acquisition
- Train & test instrumentation
- Communications
- Armament 98K
- Mission equipment package 1512K

Comanche RAH-66

Ground Systems: 1453K SLOC
Ada, C, Assembly

Training	**1182K**
Support	**127K**
Integration	**144K**

Comanche RAH-66

AEGIS Weapon System

Complete weapon system -
Deployed on destroyers and cruisers

2,592K SLOC
ADA, C++

Arleigh Burke Destroyer

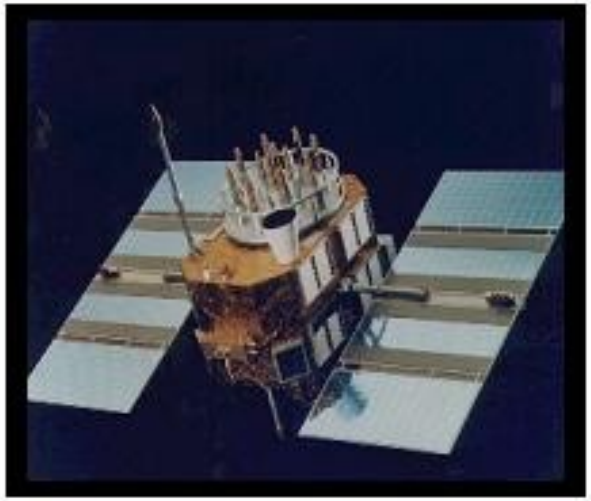
Continuous wave illuminators 15K

Radar 279K

Display	**1200K**
Test	**385K**
Weapon	**266K**
Training	**110K**
Command & decision	**337K**

NAVSTAR
Global Positioning System

Communications



Space segment

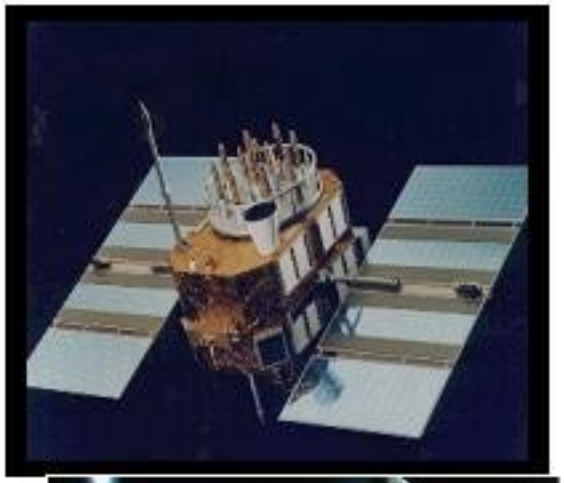
Ground antenna
Monitor station
Master control

Control segment

User segment

NAVSTAR Space Segment

Deployed



II/IIA
23 satellites

Deployed:
24K SLOC
per satellite
ADA

IIR
6 satellites

(24 spacecraft required)

Future

IIF

Future:
71K SLOC
per satellite
ADA

NAVSTAR Control Segment

Deployed:
1800K SLOC
Jovial

Future:
1900K SLOC
C++

- **Navigation**
- **Telemetry**
- **Tracking**
- **Orbit analysis**
- **Scheduling**
- **Infrastructure**

Master control station, Schriever AFB

NAVSTAR User Segment

Precision lightweight GPS receiver 100K SLOC

Miniaturized Airborne GPS receiver 100K SLOC

Defense advanced GPS receiver 200K SLOC

80K-200K SLOC
Jovial

Software is Even in Bullets!

150K SLOC - Weapon
2K SLOC - Ammunition
ADA

OICW Proof of Principle Testing 1999

Infantry Combat Weapon

Wide Area Munition

130K SLOC
Ada, C++, C, Assembly

The DoD is Focused on Software Intensive Systems

In warfighting, software has become the tool of choice.

Software challenges:

- *System complexity*
- *Growing investment ($$)*

DoD's Focus on Software Intensive Systems

- USD (AT&L) assigned responsibility for SIS to DUSD(S&T) in March 99.
- **Software Intensive Systems Directorate** established within Information Systems (ODUSD (S&T)).

- DUSD (S&T) established the **Software Intensive Systems Steering Group**
  - Senior software representatives from Services and C3I
- **Defense Software Collaborators** established to:
  - leverage Service, OSD, and FFRDC software experience
  - share ideas, lessons learned, data, and best practices
  - provide cross-service, informed sounding board for SIS

Software Intensive Systems Strategy

- SIS Strategy:
  - Policy
  - Collaboration
  - Education and Training
  - Science and Technology
- SIS activities are focused on recent Defense Science Board Recommendations.

DSB Recommendations-1

Stress Software Process and Past Performance

- Activities:
  - Software Evaluation Policy (Level 3) memo signed by USD(AT&L) in Oct 99.
  - Industry/government Software Evaluation IPT developed policy implementation guidelines. Status to be briefed during OSD track.
  - Transition to integrated Capability Maturity Model (CMMI)
- Next Steps:
  - Publish Software Evaluation Policy guidelines
  - CMMI policy update
  - CMMI technology and Users Group Conference (14-15 Nov 01)

DSB Recommendations-2

Institutionalize Independent Expert Program Reviews (IEPRs)

- Activities:
  - Tri-service Assessment Initiative completed 23 assessments, 4 ongoing
  - USD (AT&L) memo to Service Acquisition Executives Dec 00
    - Endorsed IEPRs for SIS acquisition
    - Chartered Working Group to implement IEPRs into Acquisition Policy
- Next Steps:
  - Policy plan to be presented in June 01
  - Briefing 'lessons learned from assessments' in OSD track

DSB Recommendations-3

Improve Software Skills of Acquisition and Program Management

- Activities:
  - Director, SIS active in establishing requirements for Acquisition Management and Information Technology education
  - SIS Steering Group addressing education and training issues
- Next Steps:
  - SIS Steering Group/Services establish software education priorities

DSB Recommendations-4

Collect, Disseminate and Employ Best Practices

- Activities:
  - SIS and ASD(C3I) chair IPT to develop core set of software metrics for DoD
  - SIS sponsors Practical Systems and Software Measurement Program
  - SEI evaluating current and promising Best Practices
- Next Steps:
  - Define and implement core software metrics throughout DoD.
  - For Best Practices, to determine:
    - Barriers to adoption
    - Strategies for wider deployment

DSB Recommendations-5

Restructure Contract Incentives

- Activities:
  - Contracting Issues Group (59 reps from government, industry, and academia)
- Next Steps:
  - Contracting options and contract language

DSB Recommendations-6

Strengthen the Technology Base

- Activities:
  - ACTD demonstrations of promising software engineering technologies for FY 2002
  - DARPA addressing embedded software challenges
  - Software research focus added to OSD Multidisciplinary University Research program (MURI)
    - Assured Development Technology for High-Confidence Embedded Systems
    - Heterogeneous Distributed Computing Systems
    - Assuring Software Quality

DSB Recommendations-6 (continued)

Strengthen the Technology Base

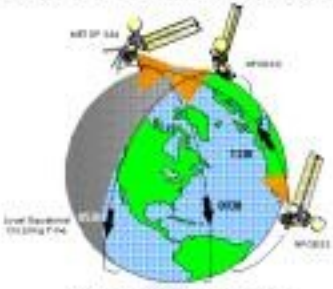
- Activities (continued):
  - Using CeBASE techniques to evaluate effectiveness and maturity of software technology demos for DARPA's Dynamic Assembly for Systems' Adaptability, Dependability and Assurance Program
  - Pilot project to transition Experience Factory technology to DoD
- Next Steps:
  - Conduct demonstrations to measure benefits of software engineering technologies

S&T Requires Strong Partnerships

Link to the Warfighter

Service Labs

Expanded Resource Base



Interagency

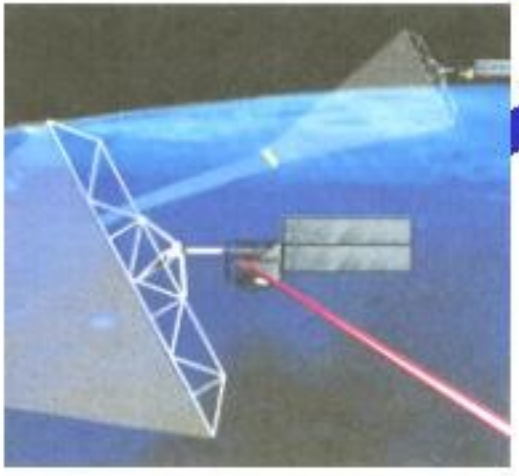
New Ideas, Knowledge

Universities

Industries

Maximum National Security Payoff

DARPA



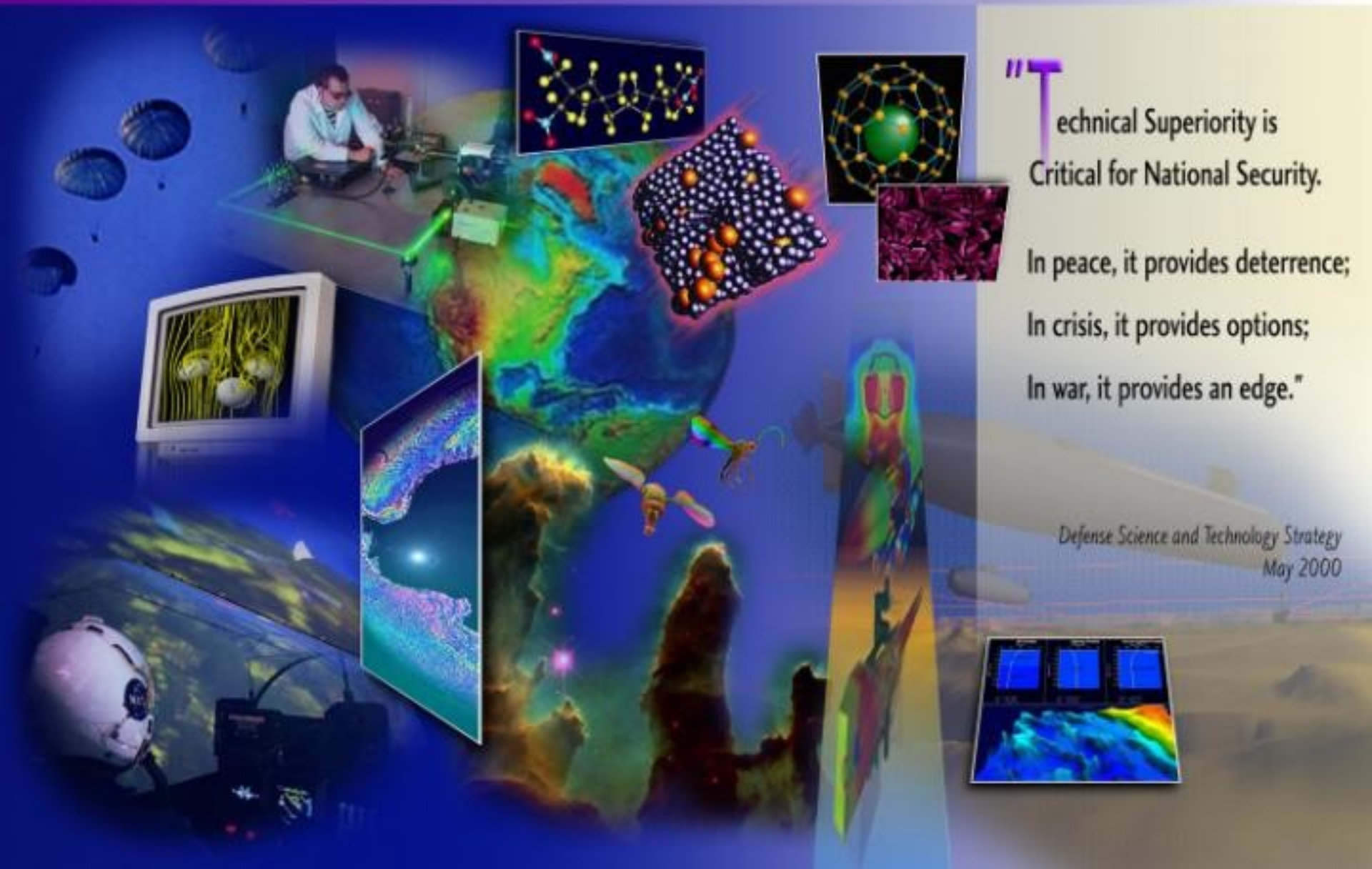
High Risk, High Payoff

International

Coalition Capability

Innovation, Transition

A Focus on Tomorrow's Possibilities



"Technical Superiority is Critical for National Security.

In peace, it provides deterrence;

In crisis, it provides options;

In war, it provides an edge."

Defense Science and Technology Strategy
May 2000